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ABSTRACT

As the risks encountered by natural hazards change and become more dynamic, so too, does the task of recovering from them. To manage natural hazards, planners must plan for the unexpected; building resilience before, during and after events. Currently, recovery funding is limited to a two-year window. Devastated communities that do not recover during this time rely on ad hoc funding to support patchy recovery beyond this. Planning for long-term recovery needs to be embedded throughout the risk assessment process to be effective. This presents a number of challenges. By identifying the longer-term risks and their consequences in advance, sustained recovery can be planned for all social, environmental and economic values (assets). This will determine what recovery interventions may be needed and when they are likely to be most effective.

Valuing recovery through risk ownership

Celeste Young¹ and Roger N Jones²

1. Victoria University, Melbourne, Victoria.

2. Bushfire and Natural Hazards CRC, Melbourne, Victoria.

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Introduction

Natural hazard risks are systemic and are becoming more dynamic and complex in nature due to a number of drivers, including climate change, changing demographics and new technologies. They cascade through social and ecological systems in unpredictable ways and the effects and consequences that result can continue for years. There is a broad consensus that natural hazard risk management requires a systemic approach, but there is also a growing awareness of the need for long-term planning to support management in this area, particularly in relation to recovery.

Despite preparation and planning, natural hazard events result in some degree of damage and loss. Thus, a better understanding of how to build resilience before, during and after events is required. This extends recovery from being a set of a short- to medium-term responses, to a suite of actions that support long-term outcomes. Even though the recovery phase is a defined area of disaster risk management, recovery planning needs to be embedded across the whole assessment process for it to be effective.

This presents a number of challenges. Recovery requires the recuperation of social, environmental and economic values (assets) and identification of the benefits they provide within a particular setting (e.g. a community, place or sector). This makes identifying longer-term risks and their consequences, and ascertaining what interventions are likely to be most effective and important. In Australia, funding for recovery, such as the *Natural Disaster Relief and Recovery Arrangements* (Attorney-General's Department), is limited to short- to medium-term recovery and is primarily focused on rebuilding physical assets such as roads and key infrastructure. Funding for longer-term recovery of 'softer' social and environmental infrastructure is largely ad hoc. In addition, economic evaluation of many intangible values and the benefits derived from them is not a straight forward process and building a business case for longer-term interventions can be difficult.

As part of the project 'Mapping and understanding Bushfire and Natural Hazard Risk at the Institutional Scale', a Risk Ownership Framework was developed for emergency management policy and practice (Young *et al.* 2017). It also provides guidance on how the risk ownership tasks can be integrated into the National Emergency Risk Assessment Guidelines (AIDR 2015). The framework extends the concept of risk ownership to all key values at risk over planning horizons that take in potential future hazard events and the full recovery cycle. This paper describes aspects of planning long-term recovery using risk ownership and how it supports resilience building and recovery outcomes for the longer-term.

Changing risk

In the last four years natural hazards have emerged as a key risk in global risk assessments. This is illustrated in the World Economic Forum Global Risk Reports 2012, 2014 and 2016 Risk Interconnection Maps. In the 2012 map, the only mention of natural hazard risk is 'persistent extreme weather' and the only risk it is connected to it is 'rising greenhouse gas emissions'. This changes dramatically in the 2014 map where natural catastrophes, extreme weather events and man-made environmental disasters feature as key risks, with multiple connections to areas such as food crisis, failure of key infrastructure and global governance. In the 2016 map, these remain key risks. The connections remain similar to 2014 but become more complex with connections to other areas of risk including water crisis, large scale involuntary migration, and failure of urban planning. To further complicate this, new risk areas are emerging particularly in relation to cyber and social risks. This dynamic landscape makes questions about what are we recovering from, and, more importantly, what are we recovering to, critical for recovery planning.

What is not well understood are the flow-on effects of these events, which can amplify into the future. At an economic level, these events can be devastating, particularly in regional areas where businesses may not have the resilience, resources or plans to deal with such events. For example, the Black Saturday bushfires in Marysville in 2009 resulted in a decline in tourist numbers to the area. From June 2009 to June 2013, 19 properties were sold, 12 of those in 2012–2013 (Argoon 2014). Six years later, the population had dropped to 250 from the 700 recorded before the fires (Morris 2015). In 2017, Marysville is still recovering.

During this project, it was observed that it could take at least seven to ten years to achieve basic recovery in hard-hit communities and that some communities might never recover. Bryant and colleagues (2014) found significant health effects such as post-traumatic stress and depression in some communities five years after the Black Saturday bushfires. At a recent Australian Institute of Disaster Resilience seminar in Melbourne, Dr Patricia Watson, a Senior Education Specialist at the National Centre for Posttraumatic Stress Disorder, stated that psychosocial recovery of communities could take 'fifteen years or longer to achieve'. Yet there is an absence of longer-term recovery strategies or guidelines following events for social or environmental values (Young, Symons & Jones 2015). This is important because without these, there is no overarching direction for how recovery should be managed to achieve long-term recovery or a strategic 'destination' for communities to guide programs. This can result in poor recovery outcomes that do not meet the needs of communities.

The big lesson we've learnt is: before you go putting in any infrastructure, make sure you do your planning. Do your social planning, do strategic planning about what your community's going to need.... What we saw

I think has been unprecedented with the generosity and how it's been managed needs for the future to be managed a lot better.
(Morris 2015)

Recovery itself is context-specific and no two communities recover in the same way. Recovery is dependent on many factors including the geographical, social and economic context, type of hazard and the level of impact. That is why risk ownership is useful as it provides a constant thread through the dynamic planning landscape. Quite simply, where there is a risk there needs to be a risk owner. If there is no owner it is very likely that it is not being managed.

Risk ownership and recovery

'Risk ownership' is used to define who owns a risk and how they own it. There are two ways a risk can be owned: through the ownership of assets (Productivity Commission 2014) and through the ownership of activities related to mitigating or reducing the risk and the consequences of its impacts (International Risk Standard ISO 31000). Here the focus is on values at-risk, expanding the concept of assets from conventional tangible assets to include economic, social, environment and built assets and the activities associated with them in relation to natural hazard risk.

The Risk Ownership Framework for Emergency Management Policy and Practice (Young *et al.* 2017) was developed in collaboration with emergency management organisations and risk practitioners as part of a Bushfire and Natural Hazards CRC project and provides a basis for implementation.

The framework is intended for use by governments, communities and businesses that are part of, or work with, the emergency management sector. The framework has three components:

- Key concepts and knowledge areas that support risk ownership and strategic decision-making.
- A values-based companion process that links ownership of values to ownership of risk (Figure 1).
- Tools that can be used to support the assessment process.

The companion process is designed so that key tasks can be integrated into current risk planning and assessments. For example, Figure 2 shows key tasks placed within the phases of the NERAG process. The orange squares show where new steps need to be included. The white squares show common risk tasks that may need to be adjusted to accommodate strategic timeframes and also assessment of values. This approach allows the user to determine what is most relevant to their organisation and adapt tasks to suit their decision-making context. Negotiating consensus is a critical aspect of enabling stakeholder support and buy-in.

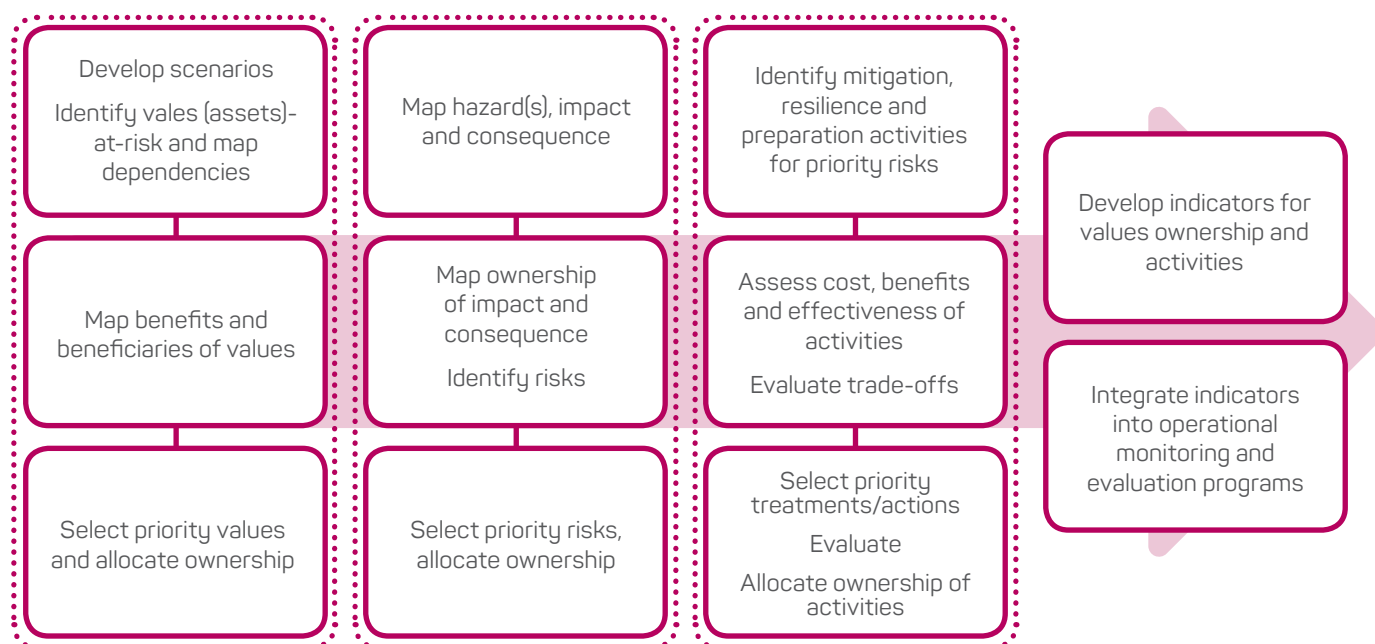


Figure 1: Values-led decision-making process.

NERAG	Negotiate consensus				
Establish the context	1. Develop hazard based scenarios	2. Identify values (assets) and map dependencies	3. Map benefits and who benefits from values	4. Select priority values	5. Allocate ownership of values
Identify, analyse and evaluate risk	6. Map hazard/s, impact and consequence across short – long term timeframe	7. Map ownership of impact and consequence	8. Identify risk	9. Select priority risks	10. Allocate ownership of risk
Risk treatment	11. Identify risk mitigation/ resilience/ preparation activities	12. Assess potential cost, benefits and effectiveness of actions	13. Evaluate trade-offs	14. Select treatments/ actions for priority risks	16. Evaluate and allocate ownership of actions
Monitor and review	17. Develop indicators to monitor progress and outcomes			18. Integrate indicators into ongoing monitoring and evaluation program	

Figure 2: Key tasks within the phases of the NERAG process.

The framework allows ‘owners’ to be categorised as institutions, groups and individuals. Each category helps classify the different actors who make up the ownership system and can be used to define how they exercise ownership (Table 1). Institutions provide many of the formal structures for recovery. Communities and groups have a largely informal but critical role. Individuals have personal responsibility and can take on roles at the community level. These definitions are fairly porous and offer the potential for public-private ownership and shared ownership arrangements.

Ownership pertaining to recovery can be divided into the three decision-making areas identified in the framework (Table 2).

The questions in Table 2 show the complications inherent in anticipating the recovery process. There is significant literature on recovery from natural disasters, but although it often concentrates on all values, the ones typically enacted are the more tractable values where costing, financing and rebuilding are more straightforward.

Part of the complexity is that every event is different and even with thorough pre-planning and preparation, much of the damage and loss experienced may not have been anticipated. Rapid appraisal will quickly identify which key values have suffered the most damage and will identify areas where recovery is most needed. However, one of the most important aspects of recovery is to quickly

Table 1: Levels of risk ownership.

Level	Definition	Emergency management context
Institutional	Formal or informal structures and arrangements that provide 'the rules of the game' (North, 1990) that govern and shape behaviour of a common set of groups and individuals.	Community, state, local and federal government, boundary organisations, business and industry.
Group	Groups of individuals who share a common interest or purpose.	A particular community, organisation, agency or network (this can also be a virtual community).
Individual	Individual person or legal entity.	Risk manager, house owner, property manager.

Source: Young *et al.* 2017

Table 2: Areas of decision-making related to risk ownership and relevance to recovery.

Decision-making area	Focus	Recovery questions
Ownership of assets at risk from natural hazards.	Identification of key values that sustain a community, place or sector.	What values do we most need to sustain our community into the future? Who owns these values?
Ownership of the risks associated with natural hazard event impacts and short to long-term consequences (both direct and indirect).	Identification of how impacts and consequences to key values result in damage and loss.	What values are likely to need some form of recovery after an event or events? Who are the owners of the impact and consequences for those values over the short to long-term? Who are the owners of the recovery process for the community, place or sector?
Ownership of actions in relation to strategic risk management over the planning-preparation, event and recovery cycle.	Identification of specific actions to identify, recover and sustain key values. Identification of actions to build resilience that will support the recovery process.	What interventions are needed and when? What short-term actions can contribute to the longer-term recovery outcomes and resilience? What are we recovering to?

return people to a state of safety and security so they can recover and avoid the ongoing sense of dislocation and flow-on effects and consequences that may result. This requires a collaborative effort from multiple agencies and organisations including peak bodies, not-for-profit organisations and community groups that play a specific role in supporting and facilitating recovery. Consideration should be given these organisation as a separate institutional group during allocation of risk ownership across the planning process (Young, Jones & Symons 2016).

Complexities of ownership

There are complexities related to risk ownership. Shared ownership can lead to a lack of clarity as to how a risk is owned or what aspects may be unowned. This is the case with overarching, intangible values that

depend on multiple stakeholders, such as resilience and community wellbeing that are critical for recovery. For example, for consequences such as mental health issues, a government may be accountable and pay for overall community health, provide welfare support and specific programs, but an agency may be responsible for managing and delivering those programs and the community and individuals also take on an aspect of responsibility and payment. In such cases, ascertaining who is responsible, who is accountable and who pays is critical.

Ownership may be unacknowledged until an event occurs. Unprepared owners may not be able to fulfil their ownership obligations. In some cases, the size of the event can exceed the capacity of risk owners to effectively prepare for an event and ownership can be transferred as a result. For example, the cost of recovery from the 2011 floods in Queensland resulted in Australian taxpayers paying a flood levy (Carter 2012). Ownership

may also change as the associated natural hazard risks and the consequences evolve over time and this can create new risks that require new owners. A further complication is many areas of ownership are allocated through social contracts or informal arrangements and often not documented.

Unowned risks may also occur that result in poor management of them. For example, the landslide in 2011 in the Grampians, Victoria resulted in estimated tourism losses of \$25.5 to \$30.5 million. There was no dedicated state agency responsible for landslide (Ollerenshaw *et al.* 2014). This has since been rectified and Emergency Management Victoria has accountability for recovery of these events, with responsibility for activities being shared across different government agencies.

Valuing recovery

Long-term recovery requires understanding what is of value and the role of that value in sustaining a community beyond the event. Ascertaining this can be challenging as it is subjective and will often depend on who is doing the valuing as to what is given priority. Values-based approaches are useful in this context as they define what is most important through meaningful deliberation and often rely on levels of consensus between stakeholders. They also assist with the identification of potential risk owners at the beginning of the planning process. They provide a pathway for negotiating trade-offs across different groups and agendas by bringing together multiple perspectives in a way that supports decision-making (Hall & Davis 2007).

Evaluating values across tangible and intangible values is complex because it is not a case of measuring apples with apples and oranges with oranges; it is a case of making an 'economic fruit salad' that applies different methods to evaluate different values. Methods for calculating damage and loss to intangible values, particularly social and environmental values compared to those used for built infrastructure and the local economy, are still relatively under developed. This can make it hard to quantify the benefits of recovery of 'soft' values and balance them against the investment needed for their recovery. As a result, 'hard' infrastructure which has a more readily quantified return on investment, is often given preference, even if intangible losses in the long run may be greater.

Value and trade-off

Trade-offs during the risk ownership process are very different to those carried out during conventional processes. For example, in a conventional setting, efficiency and cost minimisation of potential measures are prioritised. In an environment of high uncertainty, committing greater resources can be a better strategy to manage risk, but is rarely followed because it is at odds with conventional economic management. Convention says, the higher the uncertainty, the more conservative investment should be. This sets up an

environment of perverse outcomes, where short-term savings can promote long-term losses.

Risk ownership has the potential to counteract this 'race to the bottom'. For example, if ownership of specific values in 2030 is accepted by a community of risk owners, they are more likely to invest accordingly. Trade-offs will involve comparing 'hard' measures that require direct funding with 'soft' measures that involve community effort and volunteerism with limited financial investment.

Trade-offs between a broad variety of actions across the different phases of strategic risk management (preparedness, prevention, resilience and recovery) cannot always be assessed through the standard economic methodology of calculating return on investment via cost-benefit analysis. Many of the values that are important such as community health and welfare, connectedness and resilience, which are highly valued, cannot easily be costed.

By locating and using the skills and priorities of risk owners at the individual, group and institutional levels, delegations of ownership for different actions can be assessed and trade-offs made between different owners. For example, benefits of an action may be partly public and partly private, opening up the potential for co-funding arrangements between different institutional partners. It also broadens the scope of investment from 'who pays' to incorporate time, material resources and skills.

Starting simply and bringing in more complex assessments when needed is the best strategy. Ideally, the criteria for assessment are determined during the scoping phase. This is where stakeholders set up their rules of engagement for agreeing on what is of most value. Criteria can be based on factors such as:

- cost effectiveness
- return on investment
- maintenance of specific values
- legal and statutory requirements
- available resources and finance.

Methods for evaluation can range from informal voting, ranking methods, multi-criteria analysis, return on investment and cost effectiveness (Young *et al.* 2017, Jones *et al.* 2017). Qualitative and robust measures that use simple criteria to sort options can be used as a starting point. It is also important that the process is negotiated throughout as it requires combining expert and local knowledge with economic understandings to ascertain ownership.

Resilient recovery

Resilience is fundamentally changing how we need to think about natural hazard risk and who owns it, as everyone is now a potential owner. How resilient a community is and understanding possible thresholds of resilience is important for determining what type of recovery actions might be needed. For this to be fully

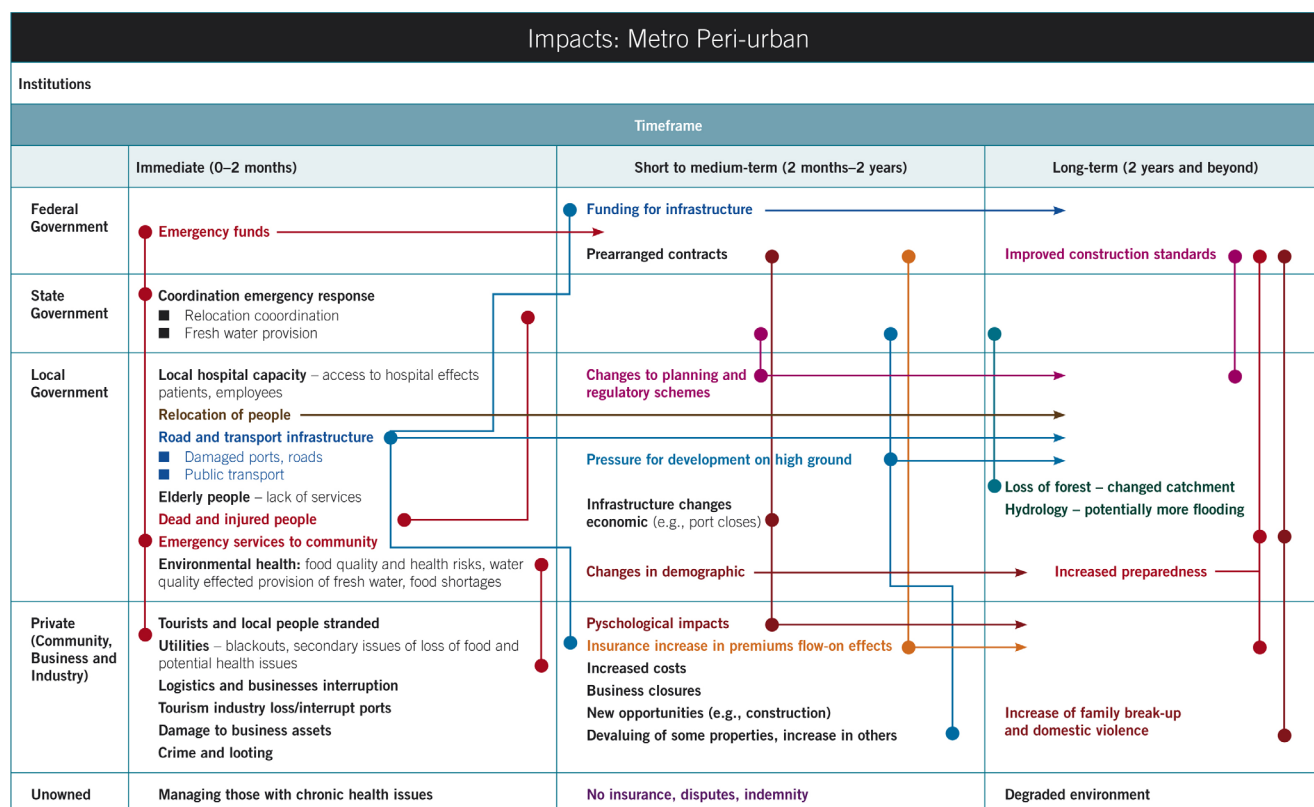


Figure 3: Mapping exercise providing a visual representation of impacts mapped from the response phase across a strategic timeframe.

Source: Adapted from Jones, Young & Handmer 2013.

realised, people need to understand the risks they are faced with, be willing to accept them and have the capability to undertake the actions associated with that ownership. Mapping risk across a timeline can assist this process by identifying future risks and what might be recovered from (Figure 3); also where these risks may increase or impede recovery and where resilience can be built. Strategic risk mapping exercises can be used to provide focus on what interventions are needed in the short-term against what longer-term outcomes may be served by these actions.

Pre-planning of risk ownership and community-scale recovery processes can also help identify the key actions that would be needed to galvanise this process. It is part of the sequence of robustness, redundancy, resourcefulness and rapidity proposed to assist communities to recover after extreme events (Bruneau *et al.* 2003). Recovery actions can be pre-planned:

- Specific recovery tasks outlined in national, state and local recovery plans can be better integrated at community level through the development of shared ownership structures involving local actors.
- The generic development of community resilience will cope better with unanticipated and sometimes very serious outcomes.

- Exploring the scenario-based decision-making process in Figure 3 will identify areas where current plans either do not exist or are immature.

Using this understanding of what we are 'recovering from' to where they will 'recover to' supports the development of more responsive and less reactive recovery arrangements

Conclusion

'People don't value what they don't understand, and I think some values and risks get dismissed because they are seen as too much hard work.' (workshop participant, Young, Jones & Symons 2016)

If we are to achieve broader and more effective recovery and build resilience within and beyond the emergency management sector, these 'difficult conversations' about what values are at risk and how we need to respond to this must be embraced. Natural hazard risks are increasingly complex as the social, environmental and economic systems that shape them change. Negotiation through this complexity to a point of consensus, where ownership of actions is accepted and acted on, is a crucial aspect of effective management. This requires collaboration and well-structured processes and facilitation, which is a long-term proposition. Maintaining

trust during this process is pivotal and requires the creation of spaces where people with different agendas can reflect, discuss and achieve consensus beyond the pervading 'just in time' decision-making context. Discomfort is part of the process, particularly at a community level where emotions and passions need to be acknowledged.

Planning extends recovery beyond surviving an event and rebuilding, to focusing on sustaining the values most treasured by planning for the future we want in the face of changes that go beyond previous experience. It is important for communities to identify what is most important and to identify the risk reduction and resilience strategies needed to protect these so recovery can occur. Different valuation methods can build a comprehensive understanding of how to make long-term investments to avoid damage and loss.

Currently in Australia, recovery funding largely focuses on tangible aspects such as the rebuilding of roads and key infrastructure. By taking ownership of this broader range of values in advance, communities can plan for long-term recovery under a variety of plausible scenarios. This involves what values should be managed, what roles the community and government play in longer-term recovery and who should be responsible, accountable and pay for this. Business cases for planning longer-term recovery need to evaluate the worth of both tangible and intangible values and the benefits derived from them, in order to support structured funding or planning for longer-term recovery of social and environmental values that sustain community wellbeing.

There is a growing appetite within emergency services and government for engagement with the community that includes a reimagining of current roles in relation to natural hazard events and how we prepare, mitigate and recover from them.

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About the authors

Celeste Young is a Collaborative Research Fellow at the Victoria Institute of Strategic Economic Studies, Victoria University. Her areas of focus are developing frameworks and methods for using and implementing research in decision-making, understanding risk, innovation and stakeholder engagement.

Roger N Jones is a Professorial Research Fellow at the Victoria Institute of Strategic Economic Studies, Victoria University. He works on understanding and managing climate change risk, natural hazard risk and the ecological economics of urban systems.